

APPENDIX 4.22

Data Quality Analysis

Appendix 4.22 Data Quality Analysis

1. A comparison of the workplan data collection goals with the actual numbers and types of samples collected was completed in order to verify the completion of the proposed analytical program. This comparison is tabulated in Tables 4.25A to 4.25G. These tables indicate that the proposed analytical program in the approved workplan was either met or exceeded. Exceedances were possible due to the addition of soil borings to the field activities.
2. Because the preparation of a Quality Assurance Plan was not in the scope of work subsequent to the approval of the workplan, a formal list of Data Quality Objectives was not prepared for every potential chemical that may have been detected prior to design of the analytical protocols. Please also note that the two more stringent ARARs (Public Health Goals (PHGs) and Primary Remediation Goals (PRGs) for drinking water) used in the comparative analysis, and arguably the least applicable to the current and future Site use, were included as applicable ARARs (for comparative purposes) subsequent to the workplan approval.

The detection limits for the detected analytes in soil (surface and subsurface), sediment, and groundwater were compared to the media-specific ARARs used for comparative analysis in Tables 4.12 to 4.24 to assess the quality of the data and validity of the analytical methods utilized in the assessment. If a laboratory's detection limit exceeds an ARAR-specific concentration then the validity of a prescribed laboratory analysis methodology should be evaluated. This comparison is tabulated in Table 4.26.

After review of this table it appears that the reported laboratory detection limits for detected analytes in soil and sediment samples did not exceed the CHHSL for commercial/industrial land use. Six of the reported laboratory detection limits for analytes detected in groundwater samples did exceed at least one of the three ARARs used for the comparative analysis (benzene, 1,4-Dichlorobenzene, bis(2-ethylhexyl) phthalate, pentachlorophenol, hexavalent chromium, and arsenic). Two of these exceed the Ocean Plan criteria (bis(2-ethylhexyl) phthalate and hexavalent chromium). A lower detection limit for benzene and 1,4-Dichlorobenzene could possibly have been achieved if drinking water standards (EPA Methods 502.2 or 524.2) were employed in the laboratory analysis protocol. However, please note that lower laboratory detection limits produced from the use of drinking water standard methodology are sensitive to matrix effects (which were observed to be inherent in samples collected from the Site) which affect quantitation limits. It is not apparent what laboratory methods could have been employed to produce lower detection limits for the semivolatile organic compounds (bis(2-ethylhexyl) phthalate and pentachlorophenol); possibly a drinking water standard laboratory methodology that applies specifically to SVOCs.

Five groundwater samples collected from soil borings were reported with detection limits for hexavalent chromium at 5 µg/L. The remainder of groundwater samples was reported with detection limits for hexavalent chromium at 1 µg/L. The higher detection limit for five of the groundwater samples was reportedly caused by matrix effects that effectively increased the practical quantitation limit or detection limit to 5 µg/L. The only inorganic chemical that was reported with a detection limit above the most stringent ARAR (0.0040 µg/L) used in the comparative analysis is arsenic. This is unavoidable due to the fact that no current laboratory method can achieve detection limits that are lower than this guidance concentration.

3. A review of the laboratory data qualifiers for all data collected was completed as a means of validating the quality of the data. The review focused on aspects of the laboratory analysis such as laboratory QA/QC procedures and reporting, sample holding times, and analytical results of field QA/QC samples, and is tabulated in Table 4.27. This table lists the specific laboratory job numbers with corresponding QA/QC data quality comments. The two types of comments noted in the analyses performed by American Scientific Laboratories (ASL) are related to matrix effects and how they have affected surrogate recovery and practical quantitation limits. In order for the laboratory to verify the validity of their findings they perform QA/QC procedures such as matrix spikes. Matrix spikes are performed by passing chemicals of known identity and concentration (surrogates) through a sample matrix and quantifying the recovery of the surrogates. If one or multiple surrogates are not recovered in quantities within a specified range it suggests that either something in the sample matrix or the laboratory equipment is causing the insufficient surrogate recovery. In order to assign the cause of the insufficient surrogate recovery to one of these two potential causes the laboratory will perform a laboratory control sample where surrogates are passed through the equipment without a sample matrix. If one or multiple surrogates are not recovered in quantities within a specified range it suggests that the laboratory equipment may be causing the insufficient surrogate recovery.

Table 4.27 indicates that laboratory control samples were analyzed in all instances where surrogate recovery or practical quantitation limits were reportedly affected by matrix effects. All but two laboratory reports with laboratory control sample analysis indicate that the laboratories comment that surrogate recovery or practical quantitation limits were affected by matrix effects are valid. The other two have laboratory control sample surrogate(s) recovery percentages that are slightly below the specified ranges which may indicate that surrogate recovery may not only be affected by matrix effects but by laboratory equipment or a combination of the two.

It was also noted in the laboratory report from Battelle Laboratories that the blank metal concentration for Thallium was greater than 10 times the method detection limit (MDL). All groundwater and drive point sample results were less than 5 times the blank concentration which indicates that the results may be impacted. The observed contamination is registering in the method blank possibly due to laboratory contamination.

The review of laboratory data qualifiers and other QA/QC related aspects of the collected laboratory data suggest that the laboratory data is valid and reliable for the environmental investigation.

4. Field QA/QC procedures in the form of blank and duplicate samples were collected during the completion of groundwater sampling activities. A field blank (FB) and trip blank (TB) were reported to contain zinc concentrations above the associated detection limit. The reported zinc concentration in the field blank (4.28 µg/L) is considerably higher than the reported zinc concentration in the trip blank (0.110 µg/L) which suggests field contamination.

Table 4.25A
Soil Boring Soil Sample Analytical Objective Analysis
Mission Bay Landfill
San Diego, California

Analytes	Proposed Analysis	Completed Analysis	Met or Exceeded Analysis Objective
VOCs	0	0	NA
Semi-volatile organic compounds (SVOCs)	20	23	Exceeded by 3
Polychlorinated biphenyls (PCBs)	0	0	NA
Pesticides	0	0	NA
Chlorinated Herbicides	0	0	NA
Polynuclear aromatic hydrocarbons (PAHs)	0	0	NA
Title 22 Metals	20	23	Exceeded by 3
Ultra-low detection sampling and analysis for 17 metals	0	0	NA
Cyanide	0	0	NA
Fluoride	0	0	NA
pH	0	0	NA
Alkalinity	0	0	NA
Chloride	0	0	NA
Specific Conductance	0	0	NA
Total Dissolved Solids	0	0	NA
Hardness	0	0	NA
Nitrate	0	0	NA
Sulfate	0	0	NA
Non-methane organic compounds (NMOC)	0	0	NA
Biogenic/fixed gases: Oxygen, carbon dioxide, methane, carbon monoxide, nitrogen	0	0	NA
Sulfur gases: Hydrogen sulfide, carbonyl sulfide, carbon disulfide, mercaptans	0	0	NA
Total organic compounds (TOC)	0	0	NA

Notes:

Analysis performed for soil samples collected from soil borings converted to monitoring wells.

NA = Not applicable

Table 4.25B
Direct Push Soil Boring Soil & Groundwater Sample Analytical Objective Analysis
Mission Bay Landfill
San Diego, California

Analytes	Proposed Analysis (soil/groundwater)	Completed Analysis (soil/groundwater)	Met or Exceeded Analysis Objective (soil/groundwater)
VOCs	0/10	0/10	NA/Met
Semi-volatile organic compounds (SVOCs)	20/10	24/13	Exceeded by 4/Exceeded by 3
Polychlorinated biphenyls (PCBs)	0/0	0/0	NA
Pesticides	0/0	0/0	NA
Chlorinated Herbicides	0/0	0/0	NA
Polynuclear aromatic hydrocarbons (PAHs)	0/0	0/0	NA
Title 22 Metals	20/0	24/0	Exceeded by 4/Met
Ultra-low detection sampling and analysis for 17 metals	0/0	0/0	NA
Cyanide	0/0	0/0	NA
Fluoride	0/10	0/13	NA/Exceeded by 3
pH	0/10	0/13	NA/Exceeded by 3
Alkalinity	0/10	0/13	NA/Exceeded by 3
Chloride	0/10	0/13	NA/Exceeded by 3
Specific Conductance	0/10	0/13	NA/Exceeded by 3
Total Dissolved Solids	0/10	0/13	NA/Exceeded by 3
Hardness	0/10	0/13	NA/Exceeded by 3
Nitrate	0/10	0/13	NA/Exceeded by 3
Sulfate	0/10	0/13	NA/Exceeded by 3
Non-methane organic compounds (NMOC)	0/0	0/0	NA
Biogenic/fixed gases: Oxygen, carbon dioxide, methane, carbon monoxide, nitrogen	0/0	0/0	NA
Sulfur gases: Hydrogen sulfide, carbonyl sulfide, carbon disulfide, mercaptans	0/0	0/0	NA
Total organic compounds (TOC)	0/0	0/0	NA

Notes:

Analysis performed on soil and groundwater samples collected from direct-push borings.

NA = Not applicable

Table 4.25C
Drive Point Groundwater Sample Analytical Objective Analysis
Mission Bay Landfill
San Diego, California

Analytes	Proposed Analysis	Completed Analysis	Met or Exceeded Analysis Objective
VOCs	4	4	Met
Semi-volatile organic compounds (SVOCs)	4	4	Met
Polychlorinated biphenyls (PCBs)	0	0	NA
Pesticides	0	0	NA
Chlorinated Herbicides	0	0	NA
Polynuclear aromatic hydrocarbons (PAHs)	0	0	NA
Title 22 Metals	0	0	NA
Ultra-low detection sampling and analysis for 17 metals	4	4	Met
Cyanide	0	0	NA
Fluoride	4	4	Met
pH	4	4	Met
Alkalinity	4	4	Met
Chloride	4	4	Met
Specific Conductance	4	4	Met
Total Dissolved Solids	4	4	Met
Hardness	4	4	Met
Nitrate	4	4	Met
Sulfate	4	4	Met
Non-methane organic compounds (NMOC)	0	0	NA
Biogenic/fixed gases: Oxygen, carbon dioxide, methane, carbon monoxide, nitrogen	0	0	NA
Sulfur gases: Hydrogen sulfide, carbonyl sulfide, carbon disulfide, mercaptans	0	0	NA
Total organic compounds (TOC)	0	0	NA

Notes:

Analysis performed on groundwater samples collected from drive points.

NA = Not applicable

Table 4.25D
Monitoring Well Groundwater Sample Analytical Objective Analysis
Mission Bay Landfill
San Diego, California

Analytes	Proposed Analysis	Completed Analysis	Met or Exceeded Analysis Objective
VOCs	11	11	Met
Semi-volatile organic compounds (SVOCs)	11	11	Met
Polychlorinated biphenyls (PCBs)	0	0	NA
Pesticides	0	0	NA
Chlorinated Herbicides	0	0	NA
Polynuclear aromatic hydrocarbons (PAHs)	0	0	NA
Title 22 Metals	0	0	NA
Ultra-low detection sampling and analysis for 17 metals	11	11	Met
Cyanide	0	0	NA
Fluoride	11	11	Met
pH	11	11	Met
Alkalinity	11	11	Met
Chloride	11	11	Met
Specific Conductance	11	11	Met
Total Dissolved Solids	11	11	Met
Hardness	11	11	Met
Nitrate	11	11	Met
Sulfate	11	11	Met
Non-methane organic compounds (NMOC)	0	0	NA
Biogenic/fixed gases: Oxygen, carbon dioxide, methane, carbon monoxide, nitrogen	0	0	NA
Sulfur gases: Hydrogen sulfide, carbonyl sulfide, carbon disulfide, mercaptans	0	0	NA
Total organic compounds (TOC)	0	0	NA

Notes:

Analysis performed on groundwater samples collected from monitoring wells.

NA = Not applicable

Table 4.25E
Sediment Sample Analytical Objective Analysis
Mission Bay Landfill
San Diego, California

Analytes	Proposed Analysis	Completed Analysis	Met or Exceeded Analysis Objective
VOCs	5	5	Met
Semi-volatile organic compounds (SVOCs)	5	5	Met
Polychlorinated biphenyls (PCBs)	5	5	Met
Pesticides	5	5	Met
Chlorinated Herbicides	5	5	Met
Polynuclear aromatic hydrocarbons (PAHs)	5	5	Met
Title 22 Metals	5	5	Met
Ultra-low detection sampling and analysis for 17 metals	0	0	NA
Cyanide	5	5	Met
Fluoride	0	0	NA
pH	0	0	NA
Alkalinity	0	0	NA
Chloride	0	0	NA
Specific Conductance	0	0	NA
Total Dissolved Solids	0	0	NA
Hardness	0	0	NA
Nitrate	0	0	NA
Sulfate	0	0	NA
Non-methane organic compounds (NMOC)	0	0	NA
Biogenic/fixed gases: Oxygen, carbon dioxide, methane, carbon monoxide, nitrogen	0	0	NA
Sulfur gases: Hydrogen sulfide, carbonyl sulfide, carbon disulfide, mercaptans	0	0	NA
Total organic compounds (TOC)	0	0	NA

Notes:

Analysis performed on sediment samples.

NA = Not applicable

Table 4.25F
Surface Soil Sample Analytical Objective Analysis
Mission Bay Landfill
San Diego, California

Analytes	Proposed Analysis	Completed Analysis	Met or Exceeded Analysis Objective
VOCs	10	10	Met
Semi-volatile organic compounds (SVOCs)	10	10	Met
Polychlorinated biphenyls (PCBs)	10	10	Met
Pesticides	10	10	Met
Chlorinated Herbicides	10	10	Met
Polynuclear aromatic hydrocarbons (PAHs)	10	10	Met
Title 22 Metals	10	10	Met
Ultra-low detection sampling and analysis for 17 metals	0	0	NA
Cyanide	10	10	Met
Fluoride	0	0	NA
pH	0	0	NA
Alkalinity	0	0	NA
Chloride	0	0	NA
Specific Conductance	0	0	NA
Total Dissolved Solids	0	0	NA
Hardness	0	0	NA
Nitrate	0	0	NA
Sulfate	0	0	NA
Non-methane organic compounds (NMOC)	0	0	NA
Biogenic/fixed gases: Oxygen, carbon dioxide, methane, carbon monoxide, nitrogen	0	0	NA
Sulfur gases: Hydrogen sulfide, carbonyl sulfide, carbon disulfide, mercaptans	0	0	NA
Total organic compounds (TOC)	0	0	NA

Notes:

Analysis performed on surface soil samples.

NA = Not applicable

Table 4.25G
Landfill Gas & Soil Vapor Sample Analytical Objective Analysis
Mission Bay Landfill
San Diego, California

Analytes	Proposed Analysis (landfill gas/soil vapor)	Completed Analysis (landfill gas/soil vapor)	Met or Exceeded Analysis Objective (landfill gas/soil vapor)
VOCs	0/10	0/10	NA/Met
Semi-volatile organic compounds (SVOCs)	0/0	0/0	NA
Polychlorinated biphenyls (PCBs)	0/0	0/0	NA
Pesticides	0/0	0/0	NA
Chlorinated Herbicides	0/0	0/0	NA
Polynuclear aromatic hydrocarbons (PAHs)	0/0	0/0	NA
Title 22 Metals	0/0	0/0	NA
Ultra-low detection sampling and analysis for 17 metals	0/0	0/0	NA
Cyanide	0/0	0/0	NA
Fluoride	0/0	0/0	NA
pH	0/0	0/0	NA
Alkalinity	0/0	0/0	NA
Chloride	0/0	0/0	NA
Specific Conductance	0/0	0/0	NA
Total Dissolved Solids	0/0	0/0	NA
Hardness	0/0	0/0	NA
Nitrate	0/0	0/0	NA
Sulfate	0/0	0/0	NA
Non-methane organic compounds (NMOC)	0/10	0/10	NA/Met
Biogenic/fixed gases: Oxygen, carbon dioxide, methane, carbon monoxide, nitrogen	0/10	0/10	NA/Met
Sulfur gases: Hydrogen sulfide, carbonyl sulfide, carbon disulfide, mercaptans	0/10	0/10	NA/Met
Total organic compounds (TOC)	50/10	50/10	Met/Met

Notes:

Analysis performed on landfill gas & soil vapor samples.

NA = Not applicable

Table 4.26
Reported Detection Data Quality Analysis
Mission Bay Landfill
San Diego, California

Analytes in Soil and Sediment

	Commercial/Industrial CHHSL (mg/kg)	Detection Limit (mg/kg)	Analysis methodology
Antimony	380.0	0.50	EPA Method 6010B/7470A
Arsenic	0.24	0.10	EPA Method 6010B/7470A
Barium	63,000.0	0.5	EPA Method 6010B/7470A
Beryllium	1,700.0	0.50	EPA Method 6010B/7470A
Cadmium	7.5	0.50	EPA Method 6010B/7470A
Chromium	100,000.0	0.50	EPA Method 6010B/7470A
Cobalt	3,200.0	0.50	EPA Method 6010B/7470A
Copper	38,000.0	0.50	EPA Method 6010B/7470A
Lead	3,500.0	0.25	EPA Method 6010B/7470A
Mercury	180.0	0.20	EPA Method 6010B/7470A
Molybdenum	4,800.0	0.50	EPA Method 6010B/7470A
Nickel	16,000.0	0.50	EPA Method 6010B/7470A
Selenium	4,800.0	0.50	EPA Method 6010B/7470A
Silver	4,800.0	0.50	EPA Method 6010B/7470A
Thallium	63.0	0.50	EPA Method 6010B/7470A
Vanadium	6,700.0	0.50	EPA Method 6010B/7470A
Zinc	100,000.0	0.50	EPA Method 6010B/7470A
Hexavalent Chromium	37.0	0.10	EPA Method 7199
Acetone	NS	5	EPA Method 8260
Benzo(b)fluoranthene	NS	2	EPA Method 8310
Chrysene	NS	5	EPA Method 8310
Acenaphthene	NS	100	EPA Method 8310
Anthracene	NS	2	EPA Method 8310
Naphthalene	NS	50	EPA Method 8310
Fluoranthene	NS	5	EPA Method 8310
Phenanthrene	NS	4	EPA Method 8310
Pyrene	NS	10	EPA Method 8310

Analytes in Groundwater

	Drinking water PHG (µg/L)	Ocean Plan (µg/L)	Drinking water PRG (µg/L)	Detection Limit (µg/L)	Analysis methodology
Diethyl ether	NS	NS	NS	0.33	EPA Method 8260
1,2-Dichloropropane	0.50	NS	0.165	1.00	EPA Method 8260
Vinyl chloride	0.05	36.0	0.0198	3.00	EPA Method 8260
Methylene chloride	NS	NS	4.276	5.00	EPA Method 8260
Benzene	0.15	5.9	0.35	1.00	EPA Method 8260
Chlorobenzene	200.0	570.0	106.07	1.00	EPA Method 8260
Ethylbenzene	300.0	4,100.0	1,339.87	1.00	EPA Method 8260
1,4-Dichlorobenzene	6.0	18.0	0.50	1.00	EPA Method 8260
Isopropylbenzene	NS	NS	658.20	1.00	EPA Method 8260
Naphthalene	NS	NS	NS	1.00	EPA Method 8260
1,2,4-Trimethylbenzene	NS	NS	12.33	1.00	EPA Method 8260
Total Xylenes	1,800.0	NS	205.73	3.00	EPA Method 8260
cis-1,2-Dichloroethene	NS	NS	60.83	1.00	EPA Method 8260
Methyl Tertiary Butyl Ether	13.0	NS	11	2.00	EPA Method 8260
Bis(2-ethylhexyl) phthalate	NS	3.50	4.80	10.00	EPA Method 8270C
Pentachlorophenol	0.4	NS	0.56	1.00	EPA Method 8270C
Hexavalent Chromium	NS	2.0	109.50	1.0 & 5.0	EPA Method 7199
Beryllium	1.0	NS	73.0	0.001	EPA Method 1669/1640
Vanadium	NS	NS	36.0	0.850	EPA Method 1669/1640
Chromium	NS	190000	54747	0.026	EPA Method 1669/1640
Cobalt	NS	NS	730.0	0.070	EPA Method 1669/1640
Nickel	12.0	5.0	730.0	0.026	EPA Method 1669/1640
Copper	170.0	3.0	1,500	0.024	EPA Method 1669/1640
Zinc	NS	20.0	11,000	0.066	EPA Method 1669/1640
Arsenic	0.0040	8.0	0.045	0.016	EPA Method 1669/1640
Selenium	NS	15.0	180.0	0.057	EPA Method 1669/1640
Molybdenum	NS	NS	180.0	0.145	EPA Method 1669/1640
Silver	NS	0.7	180.0	0.020	EPA Method 1669/1640
Cadmium	0.070	1.0	18.0	0.006	EPA Method 1669/1640
Antimony	20.0	NS	15.0	0.073	EPA Method 1669/1640
Barium	2000	NS	2600	0.018	EPA Method 1669/1640
Thallium	0.10	NS	2.4	0.002	EPA Method 1669/1640
Lead	2.0	2.0	NS	0.009	EPA Method 1669/1640
Mercury	1.2	0.04	11.0	0.00012	EPA Method 1631

EPA
524.
502.2 or 524.2
507.2 or 524.2
but problems
with matrix
effects w/
detection limits
this low
524

Table 4.27
Laboratory Report Quality Analysis and Quality Assurance Analysis
Mission Bay Landfill
San Diego, California

Sample Type(s)	Laboratory	Laboratory Job Number	Comments	LCS	Right?
Soil boring soil & groundwater	ASL	22371	Low surrogate recovery due to matrix effects	✓	✓
Soil boring soil & groundwater	ASL	22408	Low surrogate recovery due to matrix effects	✓	✓
Soil boring soil & groundwater	ASL	22866	Low surrogate recovery due to matrix effects	✓	✓
Soil boring soil & groundwater	ASL	22871	Groundwater sample B15-GW: Low surrogate recovery due to matrix effects	✓	maybe
Soil boring soil & groundwater	ASL	23518	Groundwater sample B18-GW: Low surrogate recovery due to matrix effects	✓	maybe
Monitoring well soil	ASL	23193	Soil sample SCS3-10': Higher Practical Quantitation Limit due to matrix effects	✓	✓
Monitoring well soil	ASL	23193	Soil sample SCS3-5': Higher Practical Quantitation Limit due to matrix effects	✓	✓
Monitoring well groundwater	ASL	23889	High Practical Quantitation Limits and low surrogate recovery due to matrix effects	✓	✓
Drive point groundwater	ASL	24070	Drive point sample DP 3: Low surrogate due to matrix effects	✓	✓
Monitoring well & drive point groundwater	Battelle		The blank metal concentration for Thallium was greater than 10X the MDL. All sample results were less than 5X the blank concentration which indicate that the results may be impacted. Contamination is registering in the method blank possibly due to laboratory contamination.		

Table 4.28
Duplicate Sample Quality Analysis and Quality Assurance Analysis
Mission Bay Landfill
San Diego, California

Sample Type(s)	Laboratory	Laboratory Job Number	Comments
Landfill gas & soil vapor	Severn Trent		
Landfill gas & soil vapor	H&P		
Monitoring well groundwater (Ultra Low Detection metals	Battelle		Field and Trip blanks were reported to contain zinc concentrations above the detection limits. The reported zinc concentration in the field blank (4.28 µg/L) is considerably higher than the reported zinc concentration in the trip blank (0.110 µg/L) which suggests field contamination.